

Introduction to the Cloud

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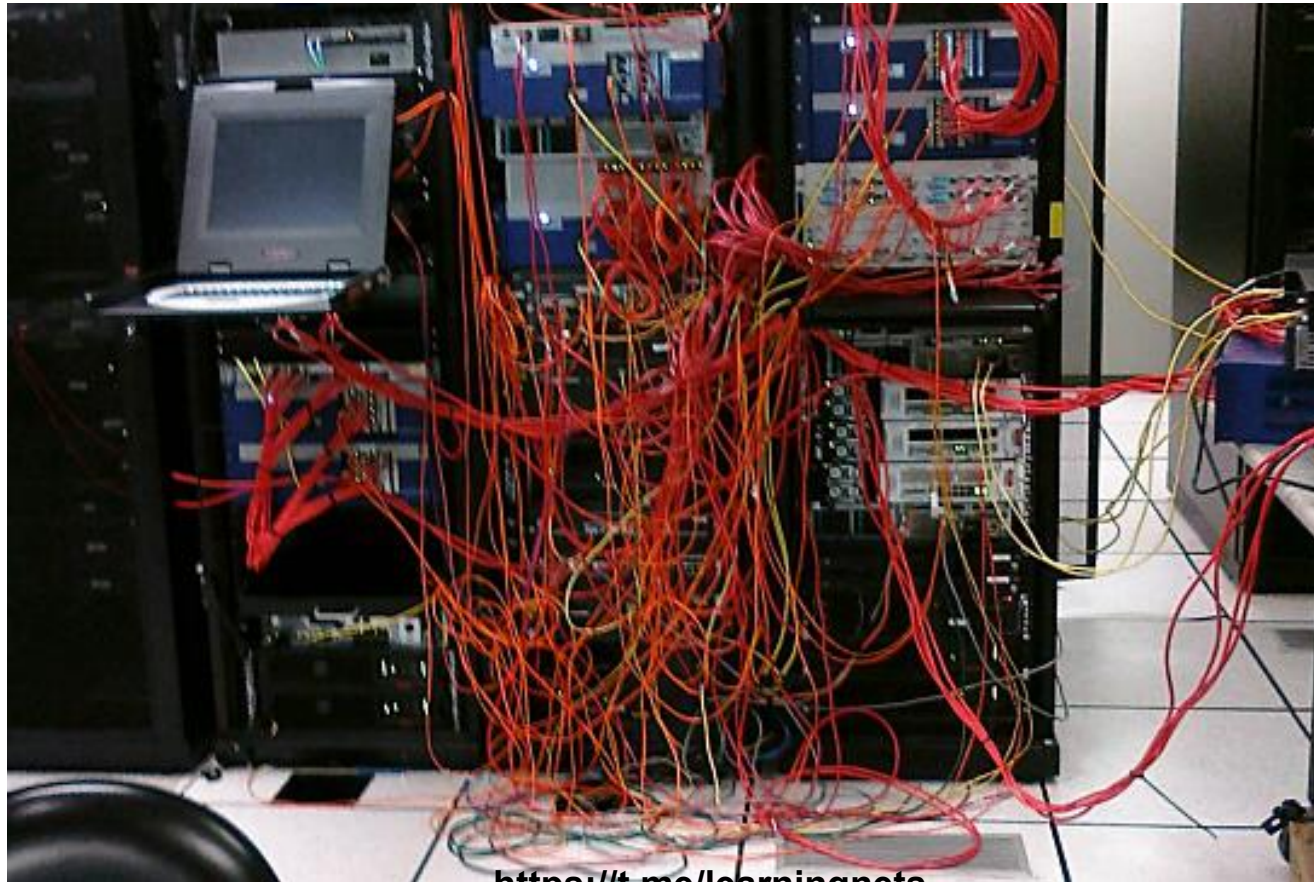


Before the cloud...

- If you needed a server, you had to:
 - Buy it
 - Install it
 - Maintain it
 - Replace it
 - Have an IT team

Before the cloud..

- You often ended up with this:



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Before the cloud...

- The same goes with:
 - Networking
 - Databases
 - User Management
 - And more...

Before the cloud...

- But there's more...



**BLACK
FRIDAY**

Jan Feb Mar Apr May Jun Jul Aug Sep **Nov**



60% CPU



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FRIDAY**

Jan Feb Mar Apr May Jun Jul Aug Sep Nov



120% CPU



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20% CPU

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90% CPU



Before the cloud...

- If you needed a server, you had to:
 - Buy it
 - Install it
 - Maintain it
 - Replace it
 - Have an IT team



The Cloud:

Compute, Networking, Storage and other services

*Managed by **SOMEONE ELSE***

Cloud Providers

- Companies who build huge data centers
- Fill it with servers, networking, cooling, electricity etc.
- Design and install various services
- Make it publicly accessible

Data Center



<https://t.me/learningsnets>
Microsoft Azure Datacenter in Washington

Data Center



~100Ks physical servers / datacenter

Cloud Services

- Clouds are huge and the competition is fierce
- Offer a lot of additional services:
 - AI
 - IOT
 - Kubernetes
 - And lots more...

In the cloud era...

- If you need a server, you can:
 - Create it in the cloud within minutes
 - Use it as you wish
 - Pay for what you use
 - Shut it down when not needed
 - Automatically maintained, patched, secured, monitored

The Cloud:

Compute, Networking, Storage and other services

*Managed by **SOMEONE ELSE***

5 Characteristics of Cloud Computing

On-Demand Self Service

Broad Network Access

Resource Pooling

Rapid Elasticity

Measured Service

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On-Demand Self Service

- No human interaction is needed for resource provisioning
- Resource can be provisioned (created) with a click of a button
- Provisioning is available 24/7

Broad Network Access

- Resources can be accessed from anywhere using the network
- Ideally high broadband
- No physical access is required at any time

Resource Pooling

- Physical resources are shared between customers
- The cloud's backbone decides which physical resource to allocate for a customer's virtual services
- Some advanced cloud services allow for physical resource separation

Rapid Elasticity

- Resources can be scaled up and down as needed, automatically
- No need to purchase resources for a one-time peak scenario

Measured Service

- Payment is done only for resources actually used
- Server time / DB storage / Function calls etc.
- Measurement usually done in high-resolution
 - Server time by the second
- No need to invest money in non-used resources

CapEx

Capital Expense

Making upfront
investment for future
use / profit

OpEx

Operating Expense

Pay for what you
actually use

Traditional IT – CapEx Oriented

- Major investment for:
 - Building data center
 - Purchasing servers
 - Purchasing air conditioning
 - Purchasing network devices
 - Purchasing software licenses (DB etc.)

...And only then –
it can be used...

Traditional IT – CapEx Oriented

- There's also OpEx involved:
 - Electricity
 - Salaries
 - Maintenance
 - And more...

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FRIDAY**

Jan Feb Mar Apr May Jun Jul Aug Sep Oct **Nov**

CapEx



**BLACK
FRIDAY**

OpEx:

Jan Feb Mar Apr May Jun Jul Aug Sep Oct **Nov**



CapEx

Capital Expense

Making upfront investment for future use / profit

- Non optimal
- Not flexible

This is what you get with the cloud



OpEx

Operating Expense

Pay for what you actually use

- Extremely flexible
- Most optimal

Types of Cloud Services

IaaS

PaaS

SaaS

laaS

- Infrastructure as a Service
- The cloud provides the underlying platform
 - Compute
 - Networking
 - Storage
- The client handles, and is responsible for all the rest

IaaS

- **Most common example:**
 - **Virtual Machines**
- **The cloud provides the host machine, networking and disks**
- **The client creates the virtual (guest) machine, installs software on it, patches it, maintains it etc.**

PaaS

- Platform as a Service
- The cloud provides platform for running apps
- Including: Compute, networking, storage, runtime environment, scaling, redundancy, security, updates, patching, maintenance etc.
- The client just needs to bring the code to run

PaaS

- Most common example:
 - Web Apps
- The cloud provides the runtime for running web apps
- The client uploads the code, and it just runs
- The client has no access to the underlying virtual machines

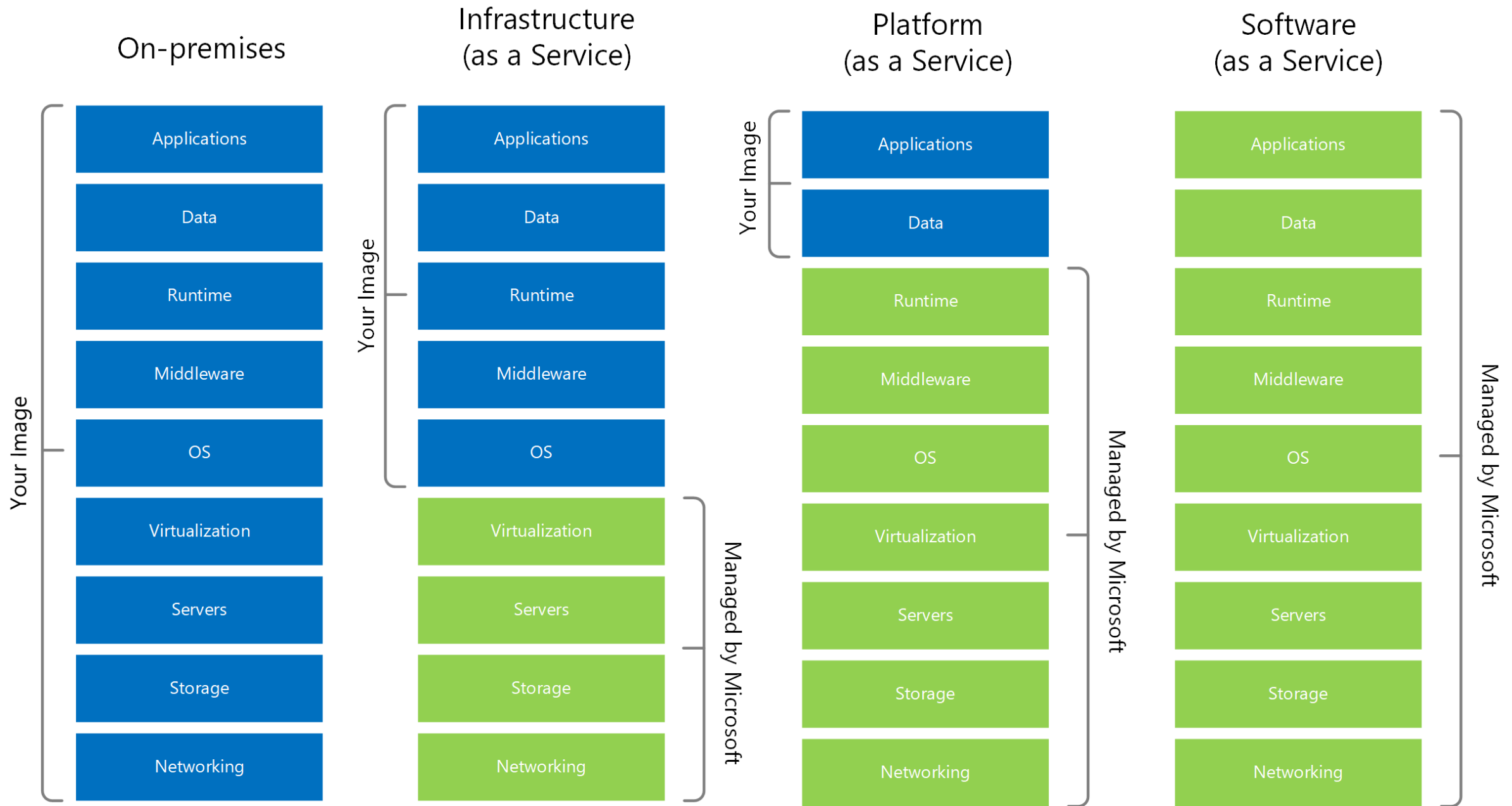
SaaS

- **Software as a Service**
- **A software running completely in the cloud**
- **The user doesn't need to install anything on-premises or on his machine**
- **The provider of the software takes care of updates, patches, redundancy, scalability etc.**

SaaS

- Common examples:





Source: <https://docs.microsoft.com/en-us/learn/framework/strategy/monitoring-strategy>

Additional Service Types

- FaaS – Functions as a Service
- DBaaS – Database as a Service
- DaaS – Desktop as a Service
- IOTaaS – IOT as a Service
- AlaaS – AI as a Service

Types of Clouds

Public

Private

Hybrid

Public Cloud

- The cloud is set up in the public network
- Managed by large companies
- Accessible through the internet
- Available to all clients and users
- Clients have no access to underlying infrastructure

Public Cloud

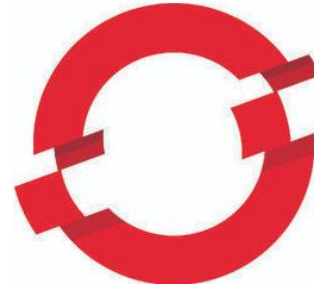


Private Cloud

- A cloud set up in an organization's premises
- Managed by the organization's IT team
- Accessible only in the organization's network
- Available to users from the organizations
- Uses private cloud infrastructure and engines
- Contains a subset of the public cloud's capabilities

Private Cloud

vmware® CLOUD™



RED HAT®
OPENSIFT
Container Platform



Azure Stack

Hybrid Cloud

- A cloud set up in an organization's premises...
- ...but also connected to the public cloud
- Workload can be separated between the two clouds
- ie. Sensitive data in the organization's premises, public data in the public cloud
- Usually managed by the public cloud, but not always

Hybrid Cloud



We're going to talk about...

Public

Private

Hybrid

Cloud Providers

- Companies which build datacenters and provide public cloud services
 - IaaS, PaaS, SaaS
 - Other services

Main Cloud Providers

Magic Quadrant

Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services



Cloud Providers Growth

Q3 2023:

Cloud	% Growth
AWS	12%
Azure	29%
Google	24%

Azure is the fastest growing public cloud, for years